
Overview

This standard is about devising and implementing strategies to diagnose faults on heavy goods and public service vehicles when the application of standard manufacturer diagnostic procedures has failed to reveal the source and cause of problems. You are also required to identify the best course of action to be taken to correct problems.

Performance criteria

You must be able to:

- P1 use suitable personal and vehicle protective equipment throughout all diagnostic related activities in the workshop
- P2 confirm with the relevant people that all standard diagnostic procedures and techniques have been systematically and correctly applied to the vehicle prior to undertaking further work
- P3 analyse all previous system fault information, diagnostic test methods and results correctly to verify the inconclusive results prior to undertaking further work
- P4 liaise with the relevant manufacturer's representative to obtain up to date information, advice and guidance relevant to the identified fault, where necessary
- P5 use **diagnostic methods** which are relevant to the symptoms presented
- P6 collect diagnostic information in a systematic and structured way which progressively eliminates all possible **causes of the fault**
- P7 apply the checks and tests that are most likely to be effective in revealing the cause of the fault
- P8 carry out all diagnostic activities following:

- P8.1 your workplace procedures
- P8.2 health, safety and environmental requirements
- P9 work in a way which minimises the risk of:

- P9.1 damage to other vehicle systems, units and components
- P9.2 contact with leakages and hazardous substances
- P9.3 damage to your working environment
- P9.4 injury to self and others
- P10 use any **equipment** required, correctly and safely throughout all diagnostic and **rectification activities**
- P11 collect sufficient diagnostic information to enable an accurate diagnosis of the fault
- P12 correctly identify the cause(s) of the **fault**
- P13 identify and record any system deviation from acceptable limits
- P14 ensure your assessment of dismantled sub-assemblies, units and components identifies their condition and suitability for repair or replacement
- P15 make clear recommendations for a suitable course of action to rectify the fault
- P16 promptly inform the relevant person(s) where repairs are uneconomic or unsatisfactory to perform
- P17 complete all system checks and tests in the most cost and time effective way for the fault presented
- P18 complete all system diagnostic activities within the agreed timescale
- P19 ensure your records are accurate, complete and passed to the relevant person(s) within the agreed timescale in the format required
- P20 promptly report any anticipated delays in completion to the relevant person(s)

Knowledge and understanding

You need to know and understand:

Legislative and organisational requirements and procedures

K1 the legislation and workplace procedures relevant to:

- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment
- K2 the legal requirements relating to the vehicle (including road safety requirements)
- K3 the implications on an Operators Licence of not carrying out repairs correctly
- K4 how to formulate and construct your own diagnostic procedures and processes in order for diagnostic activities to proceed
- K5 the importance of documenting diagnostic and rectification information following your workplace procedure
- K6 the importance of working to agreed timescales and keeping others informed of progress
- K7 the relationship between time, costs and productivity
- K8 your workplace procedure for the referral of problems
- K9 the importance of promptly reporting anticipated delays to the relevant person(s) following your workplace procedure

Electrical and electronic systems

- K10 the hazards associated with working on or near high voltage electrical vehicle components
- K11 electrical and electronic systems including types of sensors and actuators, their application and operation
- K12 how electrical and electronic vehicle systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics systems
- K13 the interaction between electrical, electronic, mechanical, pneumatic and hydraulic components within a vehicle
- K14 how mechanical, hydraulic and electrical systems interlink and interact, including multiplexing
- K15 electrical symbols, units and terms
- K16 electrical safety procedures

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Use of diagnostic and rectification equipment

K17 how to prepare and check the accuracy of *diagnostic testing equipment

K18 how to use diagnostic and rectification **equipment** for mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems, specialist repair tools and general

workshop equipment

Vehicle system faults, their diagnosis and correction

K19 how vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems are constructed, dismantled, reassembled and operate

K20 the types and causes of vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid system, component and unit **faults** and failures

K21 vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K22 how to find, interpret and use sources of information on vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid system specifications, diagnostic test procedures, repair procedures and legal requirements

K23 vehicle operating specifications for limits, fits and tolerances relating to vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems for the types of vehicle on which you work

K24 how to select the most appropriate **diagnostic testing** method for the symptoms presented

K25 how to carry out systematic **diagnostic testing** of vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems

K26 how to assess the condition of the systems and components within vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems

K27 how to interpret, evaluate and analyse test results and vehicle data in order to identify the location and cause of vehicle system **faults**

K28 how to carry out the **rectification activities** in order to correct **faults** in the vehicle mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems

K29 your workplace procedure and policy for:

K29.1 work carried out under warranty

K29.2 liaising with manufacturers and outside agencies

K30 the relationship between test methodology and the **faults** repaired – the use of appropriate testing methods

K31 how to make cost effective recommendations for rectification

K32 the importance of inspecting the vehicle following any repairs

Scope/range

1. **Causes of the fault** are:

- 1.1. mechanical
- 1.2. electrical
- 1.3. electronic
- 1.4. hydraulic
- 1.5. pneumatic

2. **Faults** cover the:

- 2.1. vehicle engine area
- 2.2. transmission and driveline area
- 2.3. chassis system area
- 2.4. electrical and electronic units and components area

3. **Diagnostic methods** are:

- 3.1. sensory
- 3.2. functional
- 3.3. measurement
- 3.4. electrical and electronic systems testing

4. **Diagnostic testing* *is defined as:

- 4.1. verify the fault
- 4.2. collect further information
- 4.3. evaluate the evidence
- 4.4. carry out further tests in a logical sequence
- 4.5. rectify the problem
- 4.6. check all systems

5. **Equipment** is:

- 5.1. diagnostic and rectification equipment for mechanical systems
- 5.2. diagnostic and rectification equipment for electrical and electronic systems
- 5.3. diagnostic and rectification equipment for hydraulic and fluid systems
- 5.4. diagnostic and rectification equipment for pneumatic systems
- 5.5. specialist repair tools
- 5.6. general workshop equipment

Glossary

This section contains examples and explanations of some of the terms used but does not form part of the standard.

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Heavy goods and public service vehicles

These are medium and large goods vehicles, buses and coaches of 3500kgs gross vehicle mass (GVM) and above.

Rectification activities

These are a suitable repair, replacement, re-coding or re-programming that rectifies the fault(s) identified from the diagnostic activities carried out.

Sensory testing methods

These may include looking, listening, smelling and touching for heat.

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